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Next-Generation Bioacoustic Analysis Software

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LONG-TERM GOALS

In the past two decades, awareness has grown that acoustic methods are often the best means for studying and monitoring marine mammals. Acoustic methods, for instance, have long been used for detection and study of sperm whales, in part because of the difficulty of visual detection: Visual surveys have been estimated to miss 38% of sperm whales that are on a ship's trackline (Barlow and Rankin 2004), and more at greater distances from the trackline. Other species are similar or worse; for instance, it is estimated that approximately 85% of Cuvier's beaked whales on the trackline are missed with visual scanning (J. Barlow, pers. comm). Acoustic methods, in contrast to visual ones, function well in darkness, fog, high sea states, and other inclement viewing conditions. Via the use of autonomous recorders, acoustic methods can also be used in remote or inhospitable areas (Širović et al. 2004, Mellinger et al. 2008) where visual monitoring would be impracticable or impossible. Software tools are needed for analyzing such data sets, even for such simple tasks as manually scanning spectrograms to find calls of interest. Acoustic localization of calling animals is often performed; whether estimates are in one dimension (bearing), two (X-Y position), or three (X-Y-Z position), analysis software is necessary. Marine mammal acoustic data is often collected in very large data sets, necessitating automated methods for data analysis. For instance, AURAL autonomous recorders (Multi-Électronique, Inc.) operate at a sample rate of 32 kHz, so that a one-year data set is 2 terabytes (TB) in size. Another type of autonomous recorder, the HARP (Wiggins 2003; J. Hildebrand, pers. comm.), operates at even higher sample rates – up to 200 kHz – making a one-year data set 12.6 TB in size. Automation tools are clearly needed for data sets of this scale.

Starting in 2000, ONR funded the development of one such tool, Ishmael (Mellinger 2001). It is a user-friendly bioacoustic analysis package for Windows. It includes displays of sound waveforms and spectrograms, recording capability for real-time input, several methods for acoustic localization, beamforming, several methods for automatic call recognition, and a sound annotation facility. Ishmael is aimed at users wishing to analyze large volumes of data quickly and easily. Ishmael quickly became popular, with thousands of downloads by users; a large proportion those downloads were in active use, and a survey in 2005 showed that 46% of respondents use it regularly. It has also been used in much ONR-funded research:

In this project, we will implement a number of improvements and updates to Ishmael.

OBJECTIVES

- Hire and train a software engineer to make improvements to Ishmael.
- Implement improved localization.
- Implement improved detection and classification.
- Implement improved acoustical measurements.
- Implement programming interfaces.
- Implement new audio I/O.
- Update Ishmael's documentation for these improvements.
- Create user group / web site for users to share information and tips.

APPROACH

The approach is to hire a software engineer to perform most of that above tasks in collaboration with myself. Research assistants will also perform much of the updating of documentation.

WORK COMPLETED

I wrote a job description and an advertisement to hire a software specialist. The ad was approved by the OSU Human Resources office in August, and posted and publicized at the start of September with a deadline of Oct. 1.

RESULTS

As of Oct. 1, the deadline for applications, there are 6 applicants (some of whom look good!). We are currently reviewing all of the applications and will interview people in early October.

IMPACT/APPLICATIONS

None yet.

RELATED PROJECTS

None yet.

PUBLICATIONS

None yet.